

Chapter E6: Benefits Analysis

This chapter presents the results of EPA's evaluation of the economic benefits associated with reductions in estimated I&E at the Pittsburg and Contra Costa facilities. The economic benefits that are reported here are based on the values presented in Chapters E4 (benefits transfer) and E5 (societal revealed preference), and EPA's estimates of I&E at the facilities based on available data (discussed in Chapter E3). Section E6-1 summarizes the estimates of economic loss, Section E6-2 discusses the benefits of potential impingement and entrainment reductions, and Section E6-3 discusses the uncertainties in the analysis.

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E6-1 SUMMARY OF CURRENT I&E AND ASSOCIATED ECONOMIC IMPACTS

Table E6-1 shows the current economic losses (based on both the benefits transfer approach and the revealed preference approach), and the flowchart in Figure E6-1 summarizes how the economic estimates were derived from the I&E estimates discussed in Chapter E3. All dollar values and loss percents reflect midpoints of the ranges for the categories of recreational, nonuse and special status species impacts.

Table E6-1: Summary of Current Economic Losses at the Pittsburg and Contra Costa Facilities (2000\$ annually)^a

		Pittsburg		Contra Costa	
		Impingement	Entrainment	Impingement	Entrainment
Total current economic losses: Benefits transfer approach (striped bass)	low	\$167,201	\$1,888,844	\$204,531	\$640,185
	high	\$259,518	\$2,931,750	\$317,462	\$993,657
Total current economic losses: Revealed preference approach for species of special concern	low	\$9,730,441	\$16,901,645	\$2,409,210	\$5,646,988
	high	\$33,505,631	\$58,198,831	\$8,295,843	\$19,444,774
Total current economic losses: Combined ^b	low	\$9,897,642	\$18,790,489	\$2,613,741	\$6,287,183
	high	\$33,765,149	\$61,130,581	\$8,613,296	\$20,438,431

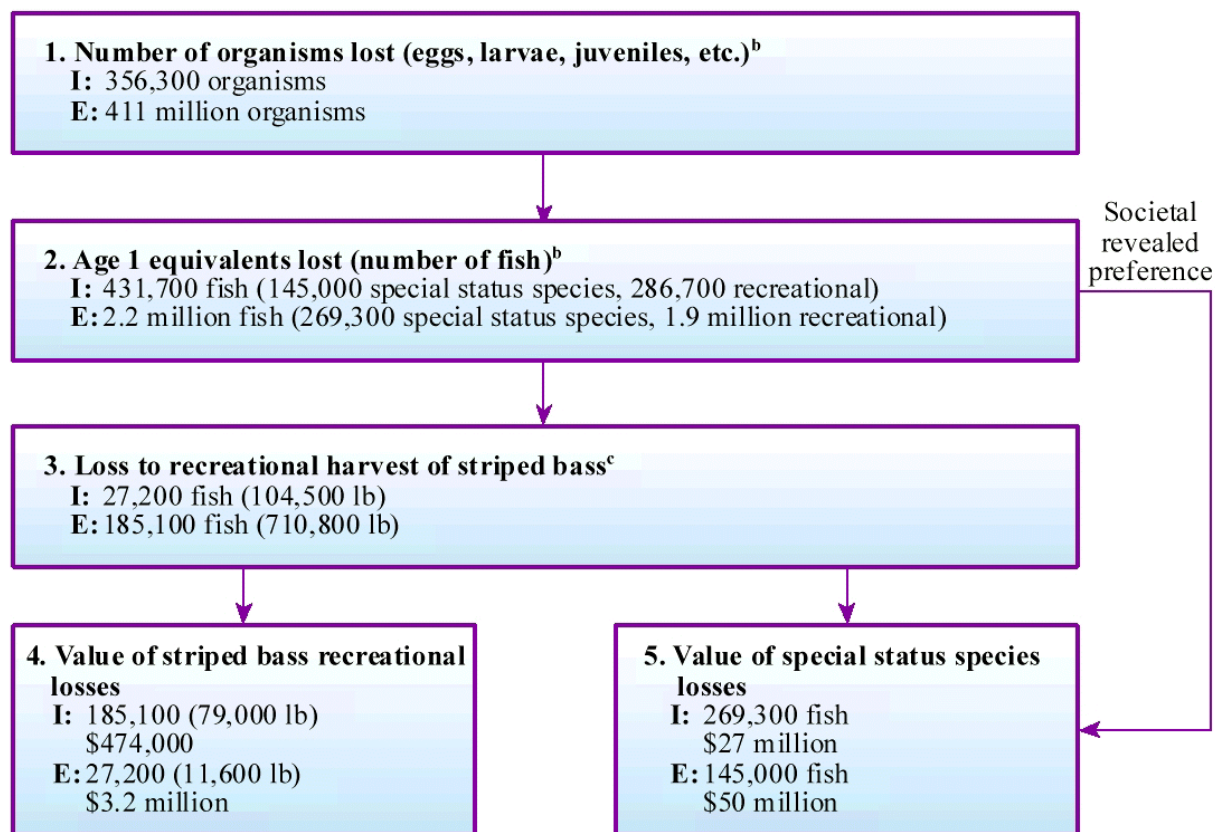
^a Losses and benefits reflect the sum of estimates for recreational and non-use values.

^b Combined economic losses are equal to the sum of losses calculated under the benefits transfer and revealed preference approaches. The estimates are summed because the benefits transfer results reflect striped bass only, whereas the revealed preference results reflect other (T&E) species.

E6-2 POTENTIAL ECONOMIC BENEFITS DUE TO REGULATION

Table E6-2 summarizes the total annual benefits from I&E reductions, as well as remaining economic losses, under scenarios ranging from 10 percent to 90 percent reductions in I&E. Table E6-3 considers the benefits of two options with varying percent reductions of I&E. Table E6-3 indicates that the benefits of one option are expected to range from \$2.5 million to \$8.5 million for a 20 percent reduction in impingement and from \$10.0 million to \$32.6 million for a 40 percent reduction in entrainment. The benefits of another option range from \$7.5 million to \$25.4 million for a 60 percent reduction in impingement and from \$15.0 million to \$48.9 million for a 60 percent reduction in entrainment.

Figure E6-1: Overview and Summary of Average Annual I&E at Pittsburg and Contra Costa and Associated Economic Values (all results are annualized)^a



^a All dollar values are the midpoint of the range of estimates.

^b From Tables E3-18 and E3-19 of Chapter E3.

^c From Tables E4-2 and E4-3 of Chapter E4.

Note: Species with I&E <1 percent of the total I&E were not valued.

E6-2: Summary of Current Economic Losses and Benefits of a Range of Potential I&E Reductions at Pittsburg and Contra Costa Facilities in San Francisco Estuary (\$2000)

		Impingement	Entrainment	Total
Baseline Losses	low	\$12,511,000	\$25,078,000	\$37,589,000
	high	\$42,378,000	\$81,569,000	\$123,947,000
Benefits of 10% reductions	low	\$1,251,000	\$2,508,000	\$3,759,000
	high	\$4,238,000	\$8,157,000	\$12,395,000
Benefits of 20% reductions	low	\$2,502,000	\$5,016,000	\$7,518,000
	high	\$8,476,000	\$16,314,000	\$24,789,000
Benefits of 30% reductions	low	\$3,753,000	\$7,523,000	\$11,277,000
	high	\$12,714,000	\$24,471,000	\$37,184,000
Benefits of 40% reductions	low	\$5,005,000	\$10,031,000	\$15,036,000
	high	\$16,951,000	\$32,628,000	\$49,579,000
Benefits of 50% reductions	low	\$6,256,000	\$12,539,000	\$18,795,000
	high	\$21,189,000	\$40,785,000	\$61,974,000
Benefits of 60% reductions	low	\$7,507,000	\$15,047,000	\$22,553,000
	high	\$25,427,000	\$48,941,000	\$74,368,000
Benefits of 70% reductions	low	\$8,758,000	\$17,554,000	\$26,312,000
	high	\$29,665,000	\$57,098,000	\$86,763,000
Benefits of 80% reductions	low	\$10,009,000	\$20,062,000	\$30,071,000
	high	\$33,903,000	\$65,255,000	\$99,158,000
Benefits of 90% reductions	low	\$11,260,000	\$22,570,000	\$33,830,000
	high	\$38,141,000	\$73,412,000	\$111,553,000

E6-3: Summary of Benefits of Potential I&E Reductions at Pittsburg and Contra Costa Facilities In San Francisco Estuary (\$2000)

		Impingement	Entrainment	Total
Preferred Option (Option 3)	low	\$2,502,000	\$10,031,000	\$12,533,000
	high	\$8,476,000	\$32,628,000	\$41,104,000
Waterbody/Capacity-based (Option 1)	low	\$7,507,000	\$15,047,000	\$22,554,000
	high	\$25,427,000	\$48,941,000	\$74,368,000

E6-3 SUMMARY OF OMISSIONS, BIASES, AND UNCERTAINTIES IN THE BENEFITS ANALYSIS

Table E6-4 presents an overview of omissions, biases, and uncertainties in the benefits estimates. Factors with a negative impact on the benefits estimate bias the analysis downward, and therefore would raise the final estimate if they were properly accounted.

Table E6-4: Omissions, Biases, and Uncertainties in the Impact Estimates

Benefits Transfer		
Issue	Impact on Benefits Estimate	Comments
Omitted recreational and commercial species	Understates benefits ^a	This analysis examined only a subset of species in this area because of data availability (e.g., only striped bass was evaluated for recreational losses, and no commercial or non-T&E forage species were included).
Long-term fish stock affects not considered	Understates benefits ^a	EPA assumed that the effects on stocks are the same each year, and that the higher fish kills would not have a cumulatively greater impact.
Effect of interaction with other environmental stressors	Understates benefits ^a	EPA does not consider how the yearly reductions in fish may make the stock more vulnerable to other environmental stressors. In addition, as water quality improves over time due to other watershed activities, the number of fish impacted by I&E may increase
Recreation participation is held constant	Understates benefits ^a	Recreational benefits for striped bass only reflect anticipated increase in value per activity outing; increased levels of participation are omitted
Boating, bird-watching, and other in-stream or near-water activities are omitted	Understates benefits ^a	The only impact to recreation considered is fishing, and only for striped bass.
Value of threatened and endangered species	Uncertain	EPA assumed values to be comparable to the per fish protection costs for the CALFED and water diversion programs.
Effect of change in stocks on number of landings	Uncertain	EPA assumed a linear stock to harvest relationship for striped bass; e.g., that a 13 percent change in stock would have a 13 percent change in landings; this may be low or high, depending on the condition of the stocks.
Nonuse measurement	Uncertain	EPA assumed that nonuse benefits are 50 percent of recreational angling benefits for striped bass only.
Revealed Preference		
Excluded species	Understates benefits	There may be additional species affected by I&E not included in the analysis (e.g., birds)
Program goals not met yet	Understates benefits	Restoration of special status fish species has not occurred yet and may take much more investment to occur, which would largely increase the per fish value
Other restoration program funds not considered	Understates benefits	There are additional habitat restoration funds from other restoration programs such as CVPIA which benefit special status fish species and have not been included in the CALFED habitat restoration costs
Exclusion of some species which benefit from T&E programs	Uncertain	Fish restoration and protection programs benefit more than the special status fish listed, and thus the per fish value may be lower than stated here. However, the per fish values are only applied to I&E impacts to special status species. The net impact is uncertain.
I&E data are from time periods that may not represent current impacts on special status species	Uncertain	Data from late 1970's reflect a time when numbers of special status fish were higher than currently found (and may thus overstate current I&E impacts). However, I&E data from the late 1980's/early 1990's reflect drought periods when special status species numbers were low. On net, impact on loss estimates is uncertain. Further, I&E impacts should reflect anticipated higher populations as they recover over time.

^a Benefits would be greater than estimated if this factor were considered.